

# MODIFIKASI KAIN NYLON-6,6 SEBAGAI KAIN ANTIBAKTERI DAN ANTIKOTOR MENGGUNAKAN NANOPARTIKEL PERAK DAN SENYAWA SILAN

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## ABSTRAK

Penelitian bertujuan untuk mengetahui karakteristik nanopartikel perak yang dihasilkan dengan reduktor  $\text{NaBH}_4$ , menunjukkan pengaruh penambahan HDTMS terhadap sudut kontak *Nylon*-6,6, mengetahui perbedaan aktivitas antibakteri kain *Nylon* tanpa dan dengan modifikasi, serta mengetahui pengaruh pencucian terhadap sudut kontak dan aktivitas antibakteri kain *Nylon* hasil modifikasi.

Nanopartikel perak dihasilkan dengan metode reduksi kimia menggunakan reduktor natrium borohidrida dan dikarakterisasi secara Spektrofotometri UV-Vis. Penambahan nanopartikel perak pada kain *Nylon* dengan cara diagitasi selama 24 jam, selanjutnya kain direndam selama 70 jam. Penambahan senyawa HDTMS pada kain *Nylon* dengan cara diagitasi selama 1 jam. Kain *Nylon* tanpa dan dengan modifikasi diuji sudut kontak dan aktivitas antibakterinya. Aktivitas antibakteri ditunjukkan dengan besarnya diameter zona bening. Uji pengaruh pencucian dilakukan pada kain *Nylon* hasil modifikasi. Adapun uji pengaruh pencucian dilakukan sesuai standar JIS L 0217. Uji aktivitas antibakteri dilakukan dengan metode difusi dan diuji signifikansi dengan ANOVA 2 arah, LSD, serta uji *t-independent*.

Spektrum UV-Vis menunjukkan puncak serapan pada panjang gelombang 411 nm yang merupakan puncak serapan nanopartikel perak. Penambahan senyawa HDTMS dapat meningkatkan sudut kontak permukaan kain *Nylon*, yaitu sebesar  $127,46^\circ$ . Aktivitas antibakteri kain *Nylon* dengan penambahan nanopartikel perak dapat menghambat pertumbuhan bakteri *Escherichia coli* dan bakteri *Staphylococcus aureus* secara signifikan. Adapun penambahan nanopartikel perak dan HDTMS dapat meningkatkan signifikansi kain *Nylon*-6,6 dalam menghambat pertumbuhan bakteri *Escherichia coli* dan bakteri *Staphylococcus aureus*. Pencucian tidak berpengaruh secara signifikan pada sudut kontak dan aktivitas antibakteri kain *Nylon*-6,6 hasil modifikasi.

**Kata kunci:** *modifikasi, aktivitas antibakteri, Nylon-6,6, nanopartikel perak, HDTMS, sudut kontak*

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# MODIFICATION OF NYLON-6,6 FABRICS AS ANTIBACTERIAL AND SELF-CLEANING TEXTILE USING SILVER NANOPARTICLES AND SILANE COMPOUND

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## ABSTRACT

This research aimed to knowing the characteristics of silver nanoparticles produced with  $\text{NaBH}_4$  reductor, showing the effect of HDTMS addition on the contact angle *Nylon*-6,6, knowing the differences in antibacterial activity of *Nylon* and *Nylon* modification, as well as knowing the effect of washing on contact angle and antibacterial activity of modified *Nylon* fabrics.

Silver nanoparticles were produced by chemical reduction methods with sodium borohydride as a reductor and were characterized by UV-Vis Spectrophotometry. Addition of silver nanoparticles on *Nylon* fabrics by agitation for 24 hours, and its soaked for 70 hours. Addition of HDTMS compound on *Nylon* fabrics by agitation for 1 hour. Futhermore, *Nylon* and modification *Nylon* were characterized by the contact angle and antibacterial activity. Antibacterial activity was indicated by a large diameter clear zone. The washing effect test was carried out on *Nylon* fabrics modified. The washing effect test was done according to JIS L 0217 standard. Antibacterial activity test was performed by diffusion method and significant test by ANOVA two-ways, LSD, and t-independent test.

The UV-Vis spectrum showed that absorption peak at wavelength 411 nm which was the peak of silver nanoparticles range. The addition of HDTMS can increase the contact angle of *Nylon* fabrics surface, which was  $127.46^\circ$ . The antibacterial activity of *Nylon* fabric with the addition of silver nanoparticles can inhibit the growth of *Escherichia coli* and *Staphylococcus aureus* bacteria significantly. Addition of silver nanoparticles and HDTMS can increase the significance of *Nylon*-6,6 fabrics in inhibiting the growth of *Escherichia coli* and *Staphylococcus aureus* bacteria. Washing does not significantly effect on the contact angle and antibacterial activity of *Nylon*-6,6.

**Keywords:** modification, antibacterial activity, *Nylon*-6,6 fabrics, silver nanoparticles, HDTMS, contact angle